

WHAT IS CLAIMED IS:

1. A visual display system for a vehicle, comprising:
 - at least one sensor operable to capture images representing scenery outside the vehicle;
 - a protective housing enclosing the at least one sensor, wherein the protective housing further comprises a transparent aperture through which the at least one sensor captures images;
 - a cleaning mechanism operable to remove obstructions from the transparent aperture; and
 - an operator display through which images representing scenery outside the vehicle are displayed.
2. The visual display system of Claim 1, wherein the at least one sensor further comprises a camera.
3. The visual display system of Claim 1, wherein the transparent aperture further comprises a rotating transparent conical surface, wherein an outer surface of the transparent conical surface is wiped within the protective housing by the cleaning mechanism to remove obstructions from the transparent aperture.
4. The visual display system of Claim 3, wherein the cleaning mechanism is located to not obstruct the at least one sensor's field of view.
5. The visual display system of Claim 2, wherein the camera further comprises an infrared camera or low light camera.
6. The visual display system of Claim 3, wherein the cleaning mechanism further comprises a mechanical brush that removes obstructions from an outer surface of the transparent aperture.

7. The visual display system of Claim 3, wherein the cleaning mechanism further comprises a cleaning fluid applicator that applies cleaning solution to the transparent aperture.
8. A visual display system for a vehicle, comprising:
 - at least one sensor operable to capture images representing scenery outside the vehicle;
 - a protective housing enclosing the at least one sensor, wherein the protective housing further comprises a transparent aperture through which the at least one sensor captures images, wherein the transparent aperture further comprises a rotating cone;
 - a cleaning mechanism operable to remove obstructions from an outer surface of the transparent aperture, wherein the cleaning mechanism is located within the protective housing and outside of a field of view of the at least one sensor; and
 - an operator display through which images representing scenery outside the vehicle are displayed, and wherein the images representing scenery outside the vehicle are derived from captured images from the at least one sensor.
9. The visual display system of Claim 1, wherein the at least one sensor further comprises a camera.
10. The visual display system of Claim 1, wherein the vehicle comprises an aircraft.
11. The visual display system of Claim 9, wherein the camera further comprises an infrared camera or low light camera.
12. The visual display system of Claim 8, wherein the cleaning mechanism further comprises a mechanical brush that removes obstructions from an outer surface of the transparent aperture.

13. The visual display system of Claim 12, wherein the cleaning mechanism further comprises a cleaning fluid applicator that applies cleaning solution to the transparent aperture.

14. A method for providing an out-the-window visual scene on a display device within a vehicle, comprising:

capturing images representing scenery outside the vehicle with at least one sensor, wherein a protective housing encloses the at least one sensor behind a transparent aperture;

cleaning the transparent aperture of the protective housing to remove obstructions to a field of view of the at least one sensor;

sending images of a portion of the out-the-window visual scene from the viewpoint of the at least one sensor;

generating an image of the scenery outside the vehicle from the captured images;

outputting image of the scenery outside the vehicle to a first display device, wherein the display device is positioned to provide the portion of a desired out-the window visual scene in combination with a window that provides another portion of the desired out-the-window visual scene.

15. The method of Claim 14, further comprising capturing images representing scenery outside the vehicle with a second sensor, wherein a protective housing encloses the second sensor behind a transparent aperture.

16. The method of Claim 15, wherein images from the at least one sensor and the second sensor are fused to create a first fused image.

17. The method of Claim 16, further comprising combining the first fused image with symbols representing objects.

18. The method of Claim 16, further comprising fusing the first fused image with an enhanced image of a portion of the out-the-window scenery from at least one of the group of a RADAR sensor and a FLIR sensor, to generate a second fused image.

19. A device, comprising:

a display device; and

a display processor operable to:

receive a first sensor image representing a portion of scenery outside the device from a sensor located within a protective housing and behind a transparent aperture, wherein a cleaning mechanism cleans the transparent aperture of the protective housing to remove obstructions to the sensor's field of view;

transform the first sensor image to a viewpoint image from an operator station in the device, wherein the viewpoint image is sized and oriented to conform to the scenery outside the device from the operator station; and

output the first operator viewpoint image to the display device, wherein the display device is positioned to provide the portion of a desired out-the-window visual scene in combination with a window that provides another portion of the desired out-the-window visual scene.

20. The device of Claim 29, wherein the display processor is further operable to combine the viewpoint image with symbols, wherein the symbols represent information regarding the operational state of the device and the moving objects detected in the images.

21. The device of Claim 20, wherein the display processor is further operable to generate symbols representing moving objects in the sensor image and the operational state of the device.

22. The device of Claim 20, wherein the display processor is further operable to generate symbols representing weather hazards in the vicinity of the device.

23. The device of Claim 20, wherein the display processor is further operable to receive an enhanced image of the out-the-window scenery in low-visibility conditions from a second sensor.

24. The device of Claim 23, wherein the display processor is further operable to fuse the viewpoint image with the enhanced image.

25. The device of Claim 20, wherein the display processor is further operable to utilize data from at least one position sensor to determine the location of the objects with respect to the device.

26. The device of Claim 20, wherein the display processor is further operable to utilize data from off-board data sources regarding the objects.

27. The device of Claim 20, wherein the sensor is a video camera.

28. The device of Claim 23, wherein the second sensor is a RADAR sensor.

29. The device of Claim 23, wherein the second sensor is a FLIR sensor.

30. The device of Claim 20, wherein the display processor is further operable to generate a common display area associated with at least two mutually exclusive windows of information on the display device, wherein the common display area can be customized by the operator to display detailed information related to the information displayed in the associated windows.

31. An aircraft, comprising:

a crewstation with cockpit windows;

a first display device for one crewmember;

a second display device for another crewmember; and

a display processor operable to:

receive an image of an out-the-window visual scene from the viewpoint of
a first sensor located within a first protective housing and behind a
first transparent aperture, wherein a first cleaning mechanism

cleans the first transparent aperture to remove obstructions to the first sensor's field of view;
receive another image of a portion of the out-the-window visual scene from the viewpoint of second sensor located within a second protective housing and behind a second transparent aperture, wherein a second cleaning mechanism cleans the second transparent aperture of the second protective housing to remove obstructions to the second sensor's field of view;;
fuse the images from the first and second sensors into a combined image to generate a first fused image;
transform the fused image to a first operator viewpoint and to a second operator viewpoint;
transform the first operator viewpoint image and the second operator viewpoint image to conform to the size and orientation of the out-the-window visual scene; and
output the first operator viewpoint image to the first display device and the second operator viewpoint image to the second display device.

32. The aircraft of Claim 31, wherein the display processor is further operable to combine the first fused image with symbols representing the objects and primary flight information for the aircraft.

33. The aircraft of Claim 32, wherein the display processor is further operable to fuse the first fused image with an enhanced image of a portion of the out-the-window scenery from at least one of the group of a RADAR sensor and a FLIR sensor, to generate a second fused image.